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SUSQUEHANNA RIVER BASIN COMMISSION
5012 LENKER STREET
MECHANICSBURG, PENNSYLVANIA 17055

PRELIMINARY REVIEW

OF

SEPTEMBER 23-26, 1975 FLOOD EVENT

(HURRICANE ELOISE)

OCTOBER 9, 1975

SUSQUEHANNA RIVER BASIN COMMISSION

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INTRODUCTION

The Susquehanna River Basin suffered another major flooding disaster for the second time in a little over three years when several storm systems including the remnants of Tropical Storm Eloise dumped heavy rains on much of the basin between September 23-26, 1975.

The following is a preliminary report on Eloise which summarizes the flood event noting affected areas, flood stages, affects of upstream storage and other related information. It must be noted, however, that a majority of the data contained herein is preliminary and will be updated by Federal, State and local agencies from which it was obtained.

CAUSAL FACTORS

To examine the events leading up to the flooding caused by Eloise we must look at the rain which was scattered over a majority of the basin on September 23 and 24. This rain was the result of an inflow of moisture from a low pressure center on the East Coast. The rain associated with this center slowly saturated the ground during the 48-hour period preceeding the arrival of Eloise in the basin, resulting in increased amounts of runoff as the tropical storm passed over the basin.

Early on September 25 the first effects of Eloise were being felt as continuing rain fell over the southern portions of the basin. The storm had traveled northward over land from Florida and joined with a storm center traveling from the west over Eastern Tennessee. As the storm center moved northward at a very slow rate of speed the intensity of the rain began to increase as moisture was being pulled from the south and circulated with the storm. As this happened, small streams in the basin began to rise rapidly and by mid-day on September 25 many were at bankfull or overbank in some areas.

Early on September 26 heavy thunderstorms associated with Eloise moved into the basin. Although the main tributaries and main stem were at low flow during this time of the year, the increased runoff and heavy rains caused quick rises along the Susquehanna and its tributaries. (See Figure 3) At some locations in

the basin the River Forecast Center reported the river rising at the rate of 8 inches to one foot an hour on the 26th.

The storm continued its northward movement throughout the 26th and spread some heavy showers into the eastern section of the basin before turning northeast and leaving our area.

EFFECTS

The crest stage levels and flood discharges resulting from the intense precipitation were varied throughout the Susquehanna River Basin.

Subbasin 1 (See Figures 1 & 2) in the Binghamton area, experienced higher flood crests than in 1972, but no major flooding was reported. Tioga County, New York, experienced flooding generally less than Agnes, but with some minor tributaries exceeding the 1972 heights. Of the 30 inundated communities, 9 were eligible for the flood insurance program.

Flood forecasting and warning varied as to efficiency between the two subbasins. In Subbasin 1, flood warnings and stage predications were accurate and timely. The Binghamton Weather Service maintained an open line to all the area radio stations.

In the New York portion of Subbasin 2, flood problems were substantial in Chemung and Steuben Counties. Flooding along the Chemung River was severe, but stages were less than those occurring from Tropical Storm Agnes. (See Figure 4)

The Big Flats, New York area downstream from Corning, experienced considerable agricultural damage. Although evacuations were commenced in Corning and Elmira, flooding occurred only in low lying areas not protected by the levees and flood walls of these communities.

A partially completed P.L. 566 small watershed structure in

the Newtown-Hoffman Watershed above Elmira was topped.

In Subbasin 2 (See Figures 1 & 2) there is some indication that damage from Eloise was greater than that of Agnes. Of the 67 communities in Subbasin 2 effected by Eloise, 13 were eligible for the National Flood Insurance Program.(See Figure 7)

In Subbasin 2, which experienced more severe flood problems, reportedly forecasts were not timely, were slow to be updated and river stages generally were predicted to be lower than actual conditions.

Evacuation efforts in the New York part of the basin in general were more efficiently conducted during this flood event than during Agnes. Road and bridge damage figures for this region are currently being computed.

The part of Subbasin 2 that lies in Pennsylvania, (See Figure 1), sustained severe damage along the Tioga River. Lawrenceville, Pennsylvania, received heavy damage.

Bloomsburg, Columbia County, Pennsylvania, in Subbasin 3 (See Figures 1 & 2), experienced fairly extensive flooding with 85 persons evacuated. The borough sewage treatment facility received $110,000 damage. Wilkes-Barre in Luzerne County was protected by a local project which had been repaired and raised to its original design elevation since Agnes. Here the flood stage of 35+ feet crested 3 feet below the top of the dikes.

The Juniata River Basin (Subbasin 6) (See Figures 1 & 2), and the upstream portion of the West Branch (Subbasin 4) did not experience severe flooding.

Extreme downstream areas of the Juniata River in the vicinity of Duncannon, Perry County, experienced road obstruction as well as impaired sewer and water service.

Widespread damage occurred along the main stem of the Susquehanna in Subbasin 5 (See Figures 1 & 2). Water service in 14 public water supply systems was impaired and 13 sewage treatment facilities were affected to varying degrees. Many mobile home parks and a variety of commercial establishments suffered losses. In Williamsport, Lycoming County, Pennsylvania, the river crested at 27 feet, considerably below the levee height of 36 feet, however, there was considerable flooding in unprotected low lying areas and also in some areas behind the levees. In nearby Lewisburg families were evacuated due to stream flooding on Bull Run which passes through the town.

Montoursville was hard hit by Loyalsock Creek flooding as was Muncy by the overflowing Muncy Creek.

Severe flooding was experienced in many communities in Subbasins 7 & 8 (See Figures 1 & 2). Twenty-four public water and public sewer systems had reductions or curtailment of service in these regions. Five schools and many businesses suffered either major or minor damage. Curfew and evacuation proceedures occurred in

the flood prone areas of Harrisburg where the river crested at 23.8 feet. York County experienced flooding in several rural communities and along many rural roads. Water table levels were extemely high producing basement flooding in many localities.

The Harrisburg River Forecasting Center was able to provide reliable forecasts on a timely basis during Eloise, giving most communities along the rivers of the basin 18-24 hours flood crest warning time.

Overall the Pennsylvania portion of the Susquehanna River Basin contained approximately 482 communities which experienced flooding to some degree.

Of these municipalities, 127 are now listed as eligible for either the emergency or regular flood insurance program (See Figure 7).

Initial total damage figures for the State of Pennsylvania are estimated at $241,700,000. Approximately 90 percent of this toll occurred in the Susquehanna Basin. Figures 5 & 6 show public water supply and sewer systems which suffered damage.

The Pennsylvania Department of Transportation reported 22 bridges washed out during Eloise. Of these, 7 were major bridges and sustained damages estimated at $18.4 million. Approximately 46 bridges were also covered by water during the flood. PennDOT also reported 418 roads covered by water at the height of the flood, two of these will require major repairs.

Harford County, Maryland, in Subbasin 8, experienced bridge and road flooding. One portion of U.S. 222, in this county, received approximately $5,000 damage. In addition, Havre de Grace experienced some municipal damage. In Cecil County, 22 homes and one business in Port Deposit were inundated with estimated damage over $500,000.

Discharge past Conowingo Dam during Eloise was 710,000 cfs as opposed to 1,130,000 for Tropical Storm Agnes (See Figure 4).

Five local and county governmental units within the Maryland portion of the basin reported some damages. All of these units and their areas of jurisdiction are eligible for the emergency flood insurance program.

Most reports from both local and general evacuation personnel claim that these operations were more effective during Eloise than the prior Agnes event. This effectiveness is evidenced by an overall increase in efficiency of operation, timely assistance to victims, reduced losses per household and generally less panic throughout the emergency period. Prior flood experience during Agnes most probably resulted in more appropriate citizen action during the Eloise flooding event.

Organizations had also profited from the earlier experience. The training of persons responsible for assistance during natural disasters has intensified during the period since June 1972, and recipients of the training had a higher level of interest.

Problems were still evident in the evacuation and assistance mechanism. The greater efficiency of operations noted during this flooding event did not apply uniformly throughout the basin. A residual need remains for adequate forecasting and advance warning on tributary streams. This generally acknowledged that the meanings of such terms as "flash flood and warning" were not readily discerned by some citizens and this may have reduced the effectiveness of the warning system. Overall the flood forecasting system worked effectively with apparent deficiencies being reported in the Chemung Basin and at Lock Haven.

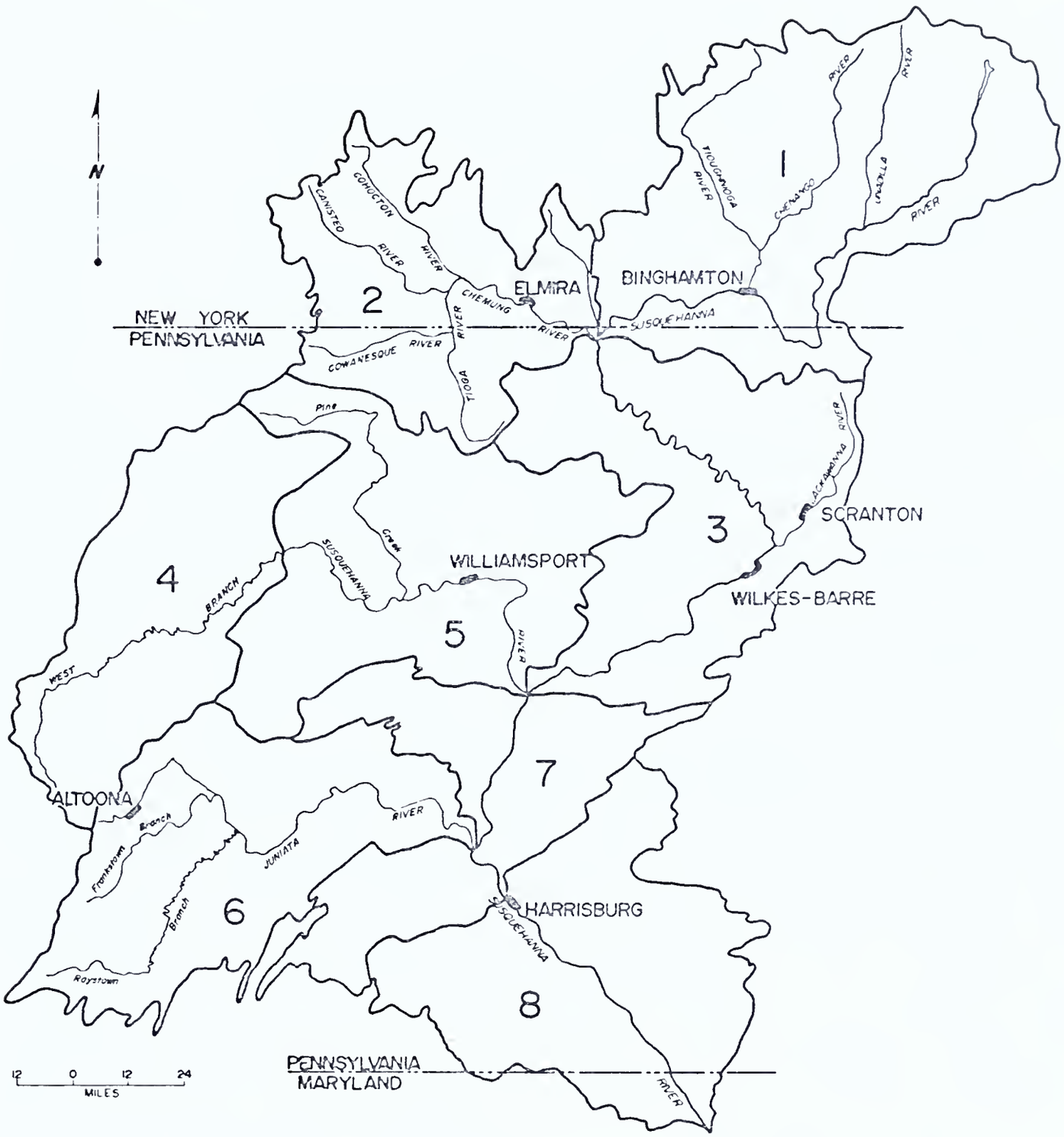
Once again a major flooding event on the Susquehanna River serves as a reminder of the need for:

1) Effective flood warning and forecasting.

2) Improved communications among the involved governmental agencies and the affected public.

3) Increased flood control measures to protect well-developed communities and established industrial areas.

4) Greatly increased efforts to control use of flood hazard areas and phasing out of existing high damage uses of unprotected areas.



THE SUSQUEHANNA RIVER BASIN COMMISSION

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HYDROLOGIC SUBBASINS

FIGURE NO. 1

FIGURE 2

AREAS OF HYDROLOGIC SUB-BASINS

SUB-BASIN	DRAINAGE	AREA (Sq. Mi.)
1	Susquehanna River, Upstream from Athens, Pennsylvania	4,944
2	Chemung River	2,604
3	Susquehanna River, Sayre, Pennsylvania to Sunbury, Pennsylvania	3,755
4	West Branch Susquehanna River, source to Renovo, Pennsylvania	2,975
5	West Branch Susquehanna River, Renovo, Pennsylvania, to mouth	4,017
6	Juniata River	3,406
7	Susquehanna River, Sunbury, Pennsylvania, to Harrisburg, Pennsylvania, (Excluding Juniata River)	2,399
8	Susquehanna River, Harrisburg, Pennsylvania, to mouth	3,410
	TOTAL SUSQUEHANNA RIVER BASIN	27,510

FIGURE 3

TOTAL PRECIPITATION FOR ELOISE
September 25-27, 1975
(Preliminary Data)

Subbasin		Inches
1	Binghamton, N.Y.	5.81
2	Spencer, N.Y.	6.39
	Chemung, N.Y.	6.32
	Troy, Pa.	7.41
	Wellsboro, Pa.	7.05
	Canton, Pa.	7.70
3	Dushore, Pa.	7.82
	Shickshinny, Pa.	7.38
	Millville, Pa.	11.21
	Wilkes-Barre, Pa.	5.19
5	Eagles Mere, Pa.	9.33
	Jersey Shore, Pa.	7.12
6	Lewistown, Pa.	6.01
	Newport, Pa.	9.49
	Beavertown, Pa.	7.96
7	Sunbury, Pa.	10.31
	Harrisburg, Pa.	12.04
	Cumberland County, Pa. (Unofficial)	14.81
8	Lancaster, Pa.	7.35
	York, Pa.	13.28

FIGURE 4

HURRICANE ELOISE FLOOD STAGE AND DISCHARGES (PRELIMINARY)
SEPTEMBER 1975

SUB-BASIN	LOCATION	FLOOD STAGE (Ft.)	DISCHARGE (cfs)	DATE/TIME	HURRICANE AGNES 1972 STAGE (Ft.)	HURRICANE AGNES 1972 DISCHARGE (cfs)
1	Waverly, N.Y.	20.2	110,000	9/27-3 a.m.	21.2	121,000
	Conklin, N.Y.	12.8	20,500	9/26-9 p.m.	12.9	26,500
	Chenango Forks, N.Y.	11.3	27,000	9/26-8 p.m.	11.2	26,200
	Campbell, N.Y.	10.3	22,000	9/26-8 a.m.	11.2	32,000
	Vestal, N.Y.	23.1	61,700	9/26-11:30 a.m.	22.4	50,400
2	Chemung, N.Y.	24.1	125,000	9/27-1 a.m.	31.6	189,000
	Erwins, N.Y.	23.6	47,000	9/26-2 p.m.	26.7	190,000
	Elmira, N.Y.	17.3	*	9/26-2 p.m.	19.3	4,000
	Corning, N.Y.	22.1	127,000	9/26-2 p.m.	27.7	215,000
	Lindley, N.Y.	23.7	86,000	9/26-noon	26.3	128,000
3	Wilkes-Barre, Pa.	35.1	257,000	9/27-1 p.m.	40.9	345,000
	Archbald, Pa.	5.9	2,750	*	6.1	3,000
4	Karthus, Pa.	11.6	33,400	*	18.6	84,300
5	Williamsport, Pa.	24.7	169,000	9/26-midnight	34.7	279,000
	Renovo, Pa.	16.0	71,500	*	26.6	181,000
	Lewisburg, Pa.	27.6	*	9/27-5 a.m.	34.2	300,000
	Lock Haven, Pa.	22.9	*	9/26-2 p.m.	29.9	190,000
6	Huntingdon, Pa.	11.8	19,500	*	20.0	57,000
	Newport, Pa.	17.1	52,900	*	33.9	187,000
7	Harrisburg, Pa.	23.8	553,000	9/27-2 p.m.	32.6	1,020,000
	Sunbury, Pa.	30.6	439,000	9/27-10:30 a.m.	35.8	620,000
8	Conowingo Dam, Md.	30.9	710,000	9/27-8 p.m.	36.8	1,130,000

* Not available.

FIGURE 5

PUBLIC WATER SUPPLIES EFFECTED BY FLOODING
(September 1975 - Tropical Storm Eloise)*

Sub-basin	
1&2	(New York data presently unavailable)
2	Pennsylvania:
	Elkland, Tioga County
	Tioga Borough, Tioga County
3	Monroeton, Bradford County
	Towanda, Bradford County
	Benton Borough, Columbia County
	Berwick, Columbia County
	Bloomsburg, Columbia County
	Millville, Columbia County
	Plymouth Township, Luzerne County
	Schickshinny, Luzerne County
	Meshoppen, Wyoming County
4	(No water supplies impaired)
5	Walker Township, Centre County
	Mackeyville, Clinton County
	Ranchtown, Clinton County
	Renovo, Clinton County
	South Renovo, Clinton County
	Lock Haven, Clinton County
	64 Water Company, Clinton County
	Roaring Branch, Lycoming County

* As of October 7, 1975, 47 of the 53 public systems impaired had service reinstated.

FIGURE 5
- 2 -

Sub-basin	
5 (Cont'd)	Hughesville, Lycoming County
	Muncy, Lycoming County
	Treverton, Northumberland County
	Sunbury, Northumberland County
	Turbotsville, Northumberland County
	Mifflinburg, Union County
6	Duncannon, Perry County
	Newport, Perry County
7	Mechanicsburg, Cumberland County
	Mt. Holly Springs, Cumberland County
	Shippensburg, Cumberland County
	Riverton Consolidated Co., Cumberland County
	Williams Grove Park, Cumberland County
	Hershey, Dauphin County
	Dauphin Consolidated (Harrisburg), Dauphin County
	Lykens, Dauphin County
	Greencastle, Franklin County
	Waynesboro, Franklin County
	Shamokin Dam, Snyder County
	Freeburg, Snyder County
	Selinsgrove, Snyder County
	Minersville, Schuykill County
	Tremont, Schuykill County

FIGURE 5
- 3 -

Sub-basin	
8	Abbottstown, Adams County
	New Oxford, Adams County
	East Berlin, Adams County
	Mt. Joy, Lancaster County
	Annville, Lebanon County
	Hanover, York County
	Dillsburg, York County
	Wrightsville, York County
	York-New Salem, York County
	York, York County
	Glen Rock, York County
8	Maryland (Information not available):

FIGURE 6

PUBLIC SEWERAGE FACILITIES DAMAGED
September 1975*

Sub-basin	
1&2	(New York data unavailable)
2	Pennsylvania:
	Westfield, Tioga County
	Blossburg Borough, Tioga County
	Elkland Borough, Tioga County
3	Athens-Sayre, Bradford County
	Millville, Columbia County
	Bloomsburg, Columbia County
	Nescopeck, Luzerne County
	Wyoming Valley, Luzerne County
	Dallas Area, Luzerne County
	Tunkhannock Township, Wyoming County
4	(No damage reported)
5	Mill Hall, Clinton County
	Lock Haven, Clinton County
	Pine Creek, Clinton County
	DuBoistown, Lycoming County
	Muncy, Lycoming County
	Jersey Shore, Lycoming County
	Montgomery, Lycoming County
	Danville, Montour County
	Delaware Township, Montour County

* As of October 7, 1975, 42 systems had returned to service of 56 damaged.

FIGURE 6
- 2 -

Sub-basin	
5 (Cont'd)	Northumberland Borough, Northumberland County
	Milton, Northumberland County
	Watsontown, Northumberland County
	Lewisburg, Union County
6	Liverpool, Perry County
	Duncannon, Perry County
	Marysville, Perry County
7	Pine Grove, Schuykill County
	Carlisle Suburban, Cumberland County
	Hampden Township, Cumberland County
	Mechanicsburg, Cumberland County
	East Pennsboro Township, Cumberland County
	Lemoyne, Cumberland County
	Lower Allen Township, Cumberland County
	Upper Allen Township, Cumberland County
	Messiah College, Cumberland County
	Hershey, Dauphin County
	Williamstown, Dauphin County
	Elizabethville, Dauphin County
	Highspire, Dauphin County
	Swatara Township, Dauphin County
	Freeburg, Snyder County
	Shamokin Dam, Snyder County

FIGURE 6
- 3 -

Sub-basin	
8	East Berlin, Adams County
	Mt. Joy, Lancaster County
	Holtwood, Lancaster County
	Lebanon, Lebanon County
	Springettsbury Township, York County
	Wrightsville, York County
	York, York County
	Hanover, York County
	Glen Rock, York County
	Dover Borough, York County
	Penn Township, York County
8	Maryland (No data available):

FIGURE 7

FLOOD INSURANCE ELIGIBILITY
DAMAGED COMMUNITIES IN THE SUSQUEHANNA RIVER BASIN*

SUBBASIN	DAMAGED	ELIGIBLE	NOT ELIGIBLE
1	30	9	21
2	67	43	24
3	81	52	29
4	--	--	--
5	148	115	33
6	15	12	3
7	96	67	29
8	119	90	29
TOTAL	556	388	168

* Preliminary.

FIGURE 8

REDUCTION EFFECT OF RESERVOIRS

AGNES - JUNE 1972
ELOISE - SEPTEMBER 1975

Location	Stream	NWS Flood Stage (a)	Reduction From Natural Stage of Event Due to Reservoirs AGNES Feet	(Preliminary) ELOISE Feet
Unadilla, N.Y. (1)	Susquehanna	11	.23	.4
Conklin, N.Y. (1)	Susquehanna	11	.11	.3
Whitney Pt., N.Y. (2)	Tioughnioga	12	2.10	2.4
Chenango Forks, N.Y. (2)	Chenango	10	1.51	2.0
Vestal, N.Y. (3)	Susquehanna	18	1.85	2.3
Hornell, N.Y. (4)	Canisteo	9(c)	8.55	1.4
West Cameron, N.Y. (4)	Canisteo	17	.92	1.0
Chemung, N.Y. (4)	Chemung	12	.38	.1
Towanda, Pa. (5)	Susquehanna	16	.47	.9
Archbald, Pa. (6)	Lackawanna	8	1.11	--
Old Forge, Pa. (6)	Lackawanna	11	.32	--
Danville, Pa. (7)	Susquehanna	20	.58	.60

FIGURE 8
- 2 -

Location	Stream	NWS Flood Stage (a)	Reduction From Natural Stage of Event Due to Reservoirs AGNES Feet	(Preliminary) ELOISE Feet
Wilkes-Barre, Pa. (7)	Susquehanna	22	.59	1.0
Clearfield, Pa. (8)	West Branch Susquehanna	10	5.27	3.3
Karthaus, Pa. (8)	West Branch Susquehanna	19	2.13	1.1
Renovo, Pa. (9)	West Branch Susquehanna	16	3.84	3.9
Lock Haven, Pa. (9)	West Branch Susquehanna	21	2.50	3.9
Williamsport, Pa. (10)	West Branch Susquehanna	20	5.25	4.2
Lewisburg, Pa. (10)	West Branch Susquehanna	18	4.17	2.3
Sunbury, Pa. (11)(d)	Susquehanna	24	1.70	1.8
Mapleton Depot, Pa. (1)	Juniata	20	4.63	4.7
Newport, Pa. (12)	Juniata	22	3.33	2.4
Harrisburg, Pa. (13)	Susquehanna	17	1.93	1.6

Modified By

(1) East Sidney

(2) Whitney Point

(3) East Sidney and Whitney Point

(4) Arkport and Almond

(5) (3) and (4)

(6) Stillwater and Aylesworth Creek

(7) (5) and (6)

(8) Curwensville

(9) Curwensville, Stevenson and Bush

(10) (9) and Sayers

(11) Reservoirs in (5) and (6)

(12) Partially completed Raystown

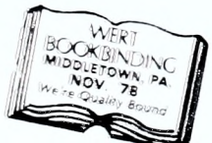
(13) (11) and (12)

(a) NWS Flood Stage: Established elevation at which water begins to overtop bank and some minor damage may occur.

(b) Modified Stage of Event: Stage which results from the reduction of the natural stage by reservoirs.

(c) NWS value not available; represents Corps of Engineers' critical stage value.

(d) Gage relocated in 1968.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